

Office Memorandum • UNITED STATES GOVERNMENT

TO : Acting Chief, Engineering Branch

FROM : Chief, Electronic Development Section

SUBJECT: U.S.A.F., Military Characteristics for Rescue Communications Equipment.

DATE: 27 June 1950

1. Secret Air Force letter, "Requirements for Development of a New Rescue Communications Equipment", outlined the desired military characteristics from which the following items have been selected:

- a) Max. weight - 12 to 18 lbs. including generator.
- b) VFO - 3.5 to 25 mc., also 500 kc fixed frequency.
- c) A₁ and A₃ emission.
- d) 20 watts R.F.
- e) Internal combustion engine generator power supply not exceeding 9 lbs. in weight, using about 3 oz. fuel per hour, fuel supply for 36 hours, provisions for hand cranking.
- f) Provisions for hand crank tape transmission.
- g) Waterproof and shock-proof construction.

2. An elementary technical analysis, included as Addendum No. 1, demonstrates that the development of equipment meeting the above requirements is not possible.

3. In view of this fact it is recommended that in order to meet the weight and operating time requirements the U.S.A.F. reviews their desires particularly toward the following:

- a) Reduction of R.F. power to 5 watts.
- b) Eliminate A₃ modulation.
- c) Eliminate VFO operation (Crystal control only).
- d) Eliminate hand crank tape transmission.

4. It is believed that the above changes will bring the design into the realm of the present state of the art.

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ADDENDUM NO. 1

Analysis of U.S.A.F. Requirements for Rescue Commo Equipment

1. Design Requirements

- a) 12 to 18 lbs. weight.
- b) Engine generator supply - 9 lbs. - 3 oz. per hour fuel rate - 36 hour operating time.
- c) A₁ and A₃ emission.
- d) 20 watts R.F.
- e) 3.5 to 25 mc. - VFO - 500 kc crystal control.

2. Size and Weight Calculations

a) Fuel requirements

36 hours at 3 oz/hour	108 oz.
Specf. gravity of fuel = .75 (assumed)	
Weight of fuel required = $.75 \left(\frac{108}{16} \right)$	5.05 lbs.
Weight of engine generator	<u>9.00 lbs.</u>
Weight of engine and fuel	14.05 lbs.
Maximum allowable weight	18.00 lbs.
Allowable weight of transmitter & receiver	4.00 lbs.

- b) It is impossible to build a transmitter-receiver unit having the desired characteristics for 4 lbs.

3. Power Supply Requirement Calculations

20 watts R.F., assume 50% efficiency, Power input =	40 watts
Oscillator (assume MOPA) requirements, 300 v @ 25 ma.	7.5 "
Modulator, 10 watts, 30% efficiency, input =	30 "
Audio Amplifier input, 300 v @ 10 ma.	3 "
Filament, 6.3 v @ 3 amps.	18.9 "
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	99.4 watts

A minimum input power of 100 watts is indicated.

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SUBJECT: Military Characteristics for Rescue Communications Equipment

TO: Director of Requirements
Headquarters USAF
Washington, 25, D. C.

1. Reference letter, this headquarters, subject, "Requirements for Development of a New Rescue Communications Equipment," dated 9 May 1950.

2. The following military characteristics for communications equipment of reference type are submitted as fulfilling both the requirements of this command in so far as operations and/or escape and evasion tactics are concerned;

a. This item to replace equipment presently utilized for this purpose, such as the AN/CRT-3 "Gibson Girl."

b. The functional characteristics shall be such as enable communications to be established by air crew survivors with ground stations, aircraft in flight, and/or other air crew survivors.

c. The survival transceiver should be developed to embody in its design all those advantages of space and weight reduction obtainable by the employment of printed circuits, miniaturized components, improved materials and advances in circuitry.

d. This equipment to be utilized by air crew survivors and/or ground search parties of any service for the transmission of intelligence that will lead to their early rescue or escape. Equipment to be attachable to air crew members for bail-out.

e. Equipment to be located in aircraft to facilitate quick attachment on the person of air crew members, or air drop by parachute to survivors.

f. This equipment would be employed in ground-to-air communication, communication with mobile radio stations, peripheral radio stations and other survivors.

g. Maximum weight should not exceed 12 to 18 pounds, including generator, and the configuration of the package should be such as to make for ease of transport by one man.

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Subj: M/C's for Rescue Comm Equip

- h. Frequency coverage should encompass a master oscillator tunable between 3.5 mc to 25 mc with two crystal controlled channels in this range, in addition to a fixed 500 kc transmitter.
- i. The life expectancy of this equipment should be in the neighborhood of four years under war conditions, with reasonable maintenance.
- j. Reliable, two-way CW communications should be available with a network of stations, the closest of which may be at a distance of 2000 miles.
- k. Voice transmission and reception range should be maximum possible.
- l. Equipment to be bi-directional on all frequencies and stable in operation at ambient temperatures of between -40° F to 145° F.
- m. There are no special requirements for fidelity or accuracy beyond capability for "A1" and "A3" transmission and reception.
- n. The transmitter should have a minimum RF output of 20 watts.
- o. Manual keying at speeds up to 30 words per minute should be possible. Also, stylus cut tape should be transmittible at the maximum speed.
- p. Frequency stability should be such that emission will remain stable during transmission, and receiver will not "creep" off frequency because of internally generated heat or change in ambient temperature. Trimmer on high frequency receiver should allow 3 KC for maximum drift, if required, although the receiver oscillator should include both manual and crystal operation.
- q. Transceiver components and power supply should be packaged in separate containers connected by cable when in use, said containers to be waterproof and shockproof to the extent that a five foot free fall will not disrupt operating effectiveness.
- r. Power supply should be a generator, driven by a small internal combustion engine. The power supply should not exceed nine pounds in weight, exclusive of fuel supply, and the fuel consumption should not exceed three ounces of fuel per hour. The unit should include a self-starter. Hand-crank gearing should be provided for operation without the motor.

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s. The equipment should be provided with a hand-cranked tape sending device with provisions for punching tape with a stylus or similar method.

t. Master oscillator features should be similar to those in radio sets SCR-694 and AN/GRC-9 with 200 KC check points over the entire frequency range (3.5 mc to 25 mc).

u. Fuel supply carried should provide for 36 hours continuous operation, with generator producing maximum power.

v. Permanent, waterproof operating instructions and the International Morse Code should be attached to the equipment. The instructions and the equipment should be simple enough to enable operation thereof by persons having no special skills.

w. Maintenance during use should be limited to changing of tubes, although the equipment should provide easy access for periodic inspections and servicing. During storage periods, none but routine inspections and maintenance should be required. A complete set of spare tubes should be provided for field use.

x. Frequency changes should be possible with simple adjustments. Tuning should be accomplished by a method similar to that employed in the SCR-694 and AN/GRC-9, namely, an RF indicator (neon bulb) and a switch for various antenna lengths.

y. Antenna should be of the long-wire type which could be draped over convenient terrain features, or mast supported. Equipment should have built-in speaker and be adaptable for headset operation.

z. Equipment should be adaptable to use with an external power supply.

FOR THE COMMANDING GENERAL:

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